

range such that exposure to a wavelength within the second wavelength range causes spurious optoelectric effects in the nontarget material that transiently obscure for a time interval concurrent with and following the laser pulse a true value of the measurable operational parameter of the device, comprising:

an electrical input for activating the device;

Al
and
a laser that generates laser output at a selected wavelength in a third wavelength range for which the nontarget material has substantial optoelectric insensitivity, the third wavelength range overlapping the first wavelength range and excluding the second wavelength range;

a beam positioner to direct at the target structure a laser pulse at the selected wavelength and at a power sufficient to ablate a portion of the target material while the device is operating; and

a detector for measuring within the time interval a true value of the operational parameter of the device while the device is operating.

Add the following claim.

12. The system of claim 2 in which the device is activated prior to generation of laser output and remains operating until at least the preselected value for the operational parameter of the device is satisfied.--

REMARKS

Claims 1-12 are in the application. Only claim 1 is in independent form. Claim 1 is amended. Claim 12 is added by this amendment.

Claims 1-11 as filed correspond to claims 11-22 that were cancelled from the parent U.S. Patent Application No. 08/538,073 to allow it to issue. For convenience, these claims will henceforth be discussed with respect to their current numbers.

Claim 11 was deemed allowable. Claims 1-10 stood "rejected under 35 U.S.C. 103(a) as being unpatentable over Lapham et al. in view of Dow et al. and Mueller. Lapham et al. in U.S. Patent No. 4,399,345 discloses laser trimming a resistor on a silicon substrate with a wavelength of 1.34 microns, which Applicant has disclosed as being within Applicant's third wavelength range. Lapham does not disclose the circuitry for measuring an operational parameter of the device, nor a beam positioner. Dow et al. in the article 'Reducing Post-Trim Drift of Thin Film Resistors (sic) by

Optimizing YAG laser Output Characteristics' teaches using an oscilloscope [sic] to measure resistance of a resistor during a functional laser trimming process. Mueller in the article 'Functional laser trimming of thin film resistors on Silicon ICs' on the first paragraph of page 72 teaches an apparatus to scan the beam. It would have been obvious to adapt Lapham et al. in view of Dow et al., and Mueller to provide this to functionally laser trim a resistor on a silicon substrate. Regarding claim 13, using a computer to compare resistance readings and control a process is old and well known and official notice is taken of the same. It would have been obvious to adapt Lapham et al. in view of Dow et al. to provide this to computer control the process, permitting software adjustments to the process."

For the Examiner's convenience, applicants now respond to this rejection as follows.

Applicants have amended claim 1 to clarify that the device is adapted to be operating during laser impingement and during measurement.

Dow et al. disclose that "[t]he temporal laser pulse shape was determined by sampling the laser beam with an HP 5082-4220 PIN photo diode and recording individual laser pulses on a Tektronix 466 storage oscilloscope." Dow et al. also disclose that "[i]t has been shown in several studies [10], [11] that long-term drift as in (2) is identical with or without the cleaning as long as time zero is defined to be immediately after lasing." Applicants note that the oscilloscope and photo diode are mentioned only with respect to determining the shape of the temporal laser pulse. The drift is measured only after lasing. Dow et al. do not disclose a laser system that trims after the resistors have been placed within and form part of more complex devices, nor do Dow et al. mention whether such devices would be operable during both laser impingement and measurement and still provide true values.

In the fifth paragraph of page 72, Muller discloses that:

"there are significant advantages if the measurement system can acquire data between the laser pulses, typically 0.3 to 1.0 milliseconds. Since the laser pulse is only about 50 nanoseconds wide at 2kHz, the laser is on only 0.01 percent of the time. By making high speed measurements the positioning system can move continuously along a trim path without the many start/stop command sequences that must alternate with measurement commands."
(Emphasis added.)

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Thus, Muller postulates that it would be desirable to move the beam positioner continuously if the measurement system is quick enough to acquire (and provide) data between laser pulses. Muller does not disclose a laser system that can provide real-time accurate device data instantaneously or continuously, irrespective of the timing of the laser pulses, such as during or immediately subsequent to the laser pulses.

Lapham is not directed to a functional laser trimming and measurement system capable of continuous accurate measurement of device parameters. Applicants request, therefore, that this rejection be withdrawn.

Applicants believe that the application is in condition for allowance and respectfully request the same.

Respectfully submitted,

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